WHAT IS CLAIMED IS:

1. A polishing pad for planarizing a surface of a semiconductor device or a precursor thereto, said pad comprising:
a polishing layer for planarizing said surface, said layer having:
   i. a hardness of about 40-70 Shore D;
   ii. a tensile Modulus of about 150 – 2,000 MPa at 40°C;
   iii. a KEL of about 100-1,000 (1/Pa at 40°C); and
   iv. an E' ratio at 30°C-90°C of about 1-4.6.

2. A polishing pad in accordance with Claim 1, said pad being an elongated sheet, a belt or a disk.

3. A polishing pad in accordance with Claim 1, said pad further comprising at least one non-polishing layer.

4. A polishing pad in accordance with Claim 1, wherein the polishing layer further comprises a macro-texture having an average dimension of greater than a micron and a micro-texture comprising a plurality of asperities with an average protrusion length of less than 0.5 microns.

5. A polishing pad in accordance with Claim 1, said polishing layer comprising a thermoplastic polymer.

6. A polishing pad in accordance with Claim 1, said polishing layer comprising a thermoset polymer.

7. A polishing pad in accordance with Claim 1, said polishing layer being non-porous.

8. A polishing pad in accordance with Claim 1, said polishing layer being porous.

9. A polishing pad in accordance with Claim 1, said polishing layer comprising a filler.

10. A polishing pad in accordance with Claim 1, said polishing layer being de-void of a filler.

11. A polishing pad in accordance with Claim 1, wherein the polishing layer is about 500 to about 2600 microns thick.

12. A polishing pad in accordance with Claim 1, wherein the polishing layer has a surface roughness of from about one to about nine micron Ra.

13. A polishing pad in accordance with Claim 1, said pad having a belt configuration and comprising a thermoplastic polyurethane.

14. A polishing pad in accordance with Claim 1, said pad having a molded belt configuration.

15. A polishing pad in accordance with Claim 1 comprising abrasive particles.

16. A polishing pad in accordance with Claim 1, wherein said pad is devoid of abrasive particles.

17. A polishing pad in accordance with Claim 1, wherein at least a portion of said pad is transparent to electromagnetic radiation having a wavelength of from about 190 to about 3500 nanometers.

18. A polishing pad in accordance with Claim 1, wherein a polishing surface of the pad has a surface roughness of about 1 to about 9 micron and an E' from 30°C to 90°C from about 1 to about 3.6.

19. A polishing pad in accordance with claim 1, wherein said polishing layer has a KEL in the range of about 125-850 (1/Pa at 40 C).

20. A polishing pad in accordance with claim 1, wherein the polishing layer has:
a surface roughness of 2-7 micron Ra,
a hardness of about 45-65 Shore D,
a tensile modulus of about 150 – 1,500 MPa at 40°C,
a KEL of about 125-850 (1/Pa at 40°C), and
an E' ratio at 30°C-90°C of about 1.0-4.0.

21. A polishing pad in accordance with claim 1, wherein the polishing layer has:
a surface roughness of 3-5 micron Ra,
a hardness of about 55-63 Shore D,
a tensile modulus of about 200 – 800 MPa at 40°C,
a KEL of about 150-400 (1/Pa at 40°C), and

an E' ratio at 30°C-90°C of about 1.0-3.5.

22. A polishing pad in accordance with Claim 1, wherein the polishing layer comprises a polyurethane.

23. A polishing pad in accordance with Claim 1, wherein the surface comprises a metal which comprises copper.

24. A polishing pad in accordance with Claim 1, wherein the surface comprises a metal which comprises tungsten.

25. A polishing pad in accordance with Claim 1, wherein the surface comprises a metal which comprises aluminum.

26. The polishing pad of claim 22 in which the polyurethane is a polyether based polyurethane.

27. The polishing pad of claim 22 in which the polyurethane is a polyester based polyurethane.

28. A polishing pad for planarizing a surface of a semiconductor device or precursor thereto, said surface having a 10 micron width metal line, the pad comprising a stiff polishing layer containing a polymer system which provides sufficient energy dissipation and low elastic recovery to provide less than 500 Angstroms of dishing on the metal line, said polishing layer being formed, at least in part, by extrusion or sintering.

29. A polishing pad in accordance with Claim 28, wherein the metal line comprises copper.

30. A process for polishing a metal damascene structure of a semiconductor wafer comprising:
biasing the wafer toward an interface between the wafer and a polishing layer of a polishing pad; flowing a polishing fluid into the interface; and
providing a means for relative motion of the wafer and the polishing pad under pressure so that the moving pressurized contact of the polishing fluid against the wafer results in planar removal along a surface of said wafer;
wherein said polishing layer is further defined as having:
i. a hardness of about 40-70 Shore D;

ii. a tensile Modulus of about 150 – 2,000 MPa at 40°C;

iii. a KEL of about 100-1,000 (1/Pa at 40°C) and

iv. an E' ratio at 30°C-90°C of about 1-5.

31. A process in accordance with Claim 30, wherein the metal of the damascene structures comprises copper.

32. The process of claim 30 in which the polishing fluid contains an oxidizer.

33. A process in accordance with Claim 30, wherein the polishing fluid contains a plurality of abrasive particles.

34. A process in accordance with Claim 30, wherein the pad comprises a plurality of particles.

35. A process in accordance with Claim 34, wherein the polishing fluid comprises particles.

36. A process in accordance with Claim 34, wherein the polishing fluid is substantially free of particles.

37. A process in accordance with Claim 35, wherein the pad is substantially free of particles.

38. A process in accordance with Claim 30, wherein the polishing fluid is substantially free of particles and the pad is substantially free of particles.

39. A process in accordance with Claim 33, wherein at least a portion of the abrasive particles comprise at least 50 weight percent organic polymer.

40. A process in accordance with Claim 33, wherein at least a portion of the abrasive particles comprise inorganic metal oxide particles.

41. A process in accordance with Claim 40, wherein the inorganic metal oxide particles comprise silica, alumina, ceria or combinations thereof.

42. The process of Claim 30 in which the polishing fluid contains a chemical that renders a portion of the metal soluble.

43. A process in accordance with Claim 30, the polishing layer comprising nano-asperities of less than 500 Angstroms along a polishing surface, and the polishing fluid further comprising a complexing agent, whereby the complexing agent is attracted to the metal and protects a surface of the metal until disrupted by a polishing pad movement occurring at a distance between the polishing pad and the metal, said distance being less than the average dimension of the nano-asperities.

44. A process in accordance with Claim 43, wherein the distance between the polishing pad and the metal is less than 10% of the average dimension of the nano-asperities.

45. A process in accordance with Claim 44, wherein the complexing agent has a viscosity average molecular weight of greater than 1000.

46. A process in accordance with Claim 44, wherein the complexing agent comprises a two or more polar moieties.

47. A polishing pad in accordance with Claim 1, wherein the E' ratio at 30°C-90°C is in the range of about 1 to about 4.

48. A polishing pad in accordance with Claim 1, wherein a polishing surface of the pad has a surface roughness of about 1 to about 9 microns, a Shore D Hardness of about 40 to about 70, a tensile modulus of about 100-2000, a KEL (1/Pa at 40°C) of 150-1000 and an E' from 30°C to 90°C from about 1 to about 5.

49. A polishing pad for planarizing a surface of a semiconductor device or a precursor thereto, said pad comprising:
a polishing layer for planarizing said surface, said layer having:
an E' ratio at 30°C-90°C of about 1-3.6.

50. A polishing pad in accordance with Claim 49, wherein the polishing layer also has a hardness of about 40-70 Shore D.

51. A polishing pad in accordance with Claim 49, wherein the polishing layer also has a tensile Modulus of about 150 – 2,000 MPa at 40°C.

52. A polishing pad in accordance with Claim 49, wherein the polishing layer also has a KEL of about 100-1,000 (1/Pa at 40°C).